nepal performance | financing | development aid

Sustainable Groundwater Development and Management in Nepal: Major Issues Confronted by a Development Bank in Nepal

Ujjwal Pradhan[31] and Ganesh Thapa[32]

ABSTRACT

GROUNDWATER EXTRACTION WITH newer technologies and its use in Nepal are very recent as compared to some other South Asian countries. The Agriculture Development Bank/Nepal (ADB/N) has been intimately involved in groundwater development for the past two decades. It is very probable that, in the future, the functions of the Bank will be limited only to lending activities without the technical support. Were it to be so, the Bank will need to find avenues for filling in the newly created vacuum if irrigation development is to be fully realized.

Therefore, this paper assesses the institutional capacity and the adequacy of irrigation support services to shallow tube wells (STWs) by the ADB/N by analyzing several systems supported by the Bank. The economic performance of the selected STWs is also presented. Suggestions are made for enhancing the Bank's institutional capacity regardless of whether it retains technical support as one of its functions.

The paper also addresses the issue of subsidy and its impact on groundwater development. It concludes with issues that confront STW development and sustainability in Nepal, in view of the positive contribution that ADB/N can make toward the goals of irrigation development in the country.

INTRODUCTION

Groundwater development potential in the Tarai of Nepal is estimated to be 250,000 hectares (ha). In addition, there is a potential for groundwater development for conjunctive use in the surface command areas in some 150,000 ha. Total area irrigated using groundwater in the Tarai is estimated to be about 110,000 ha, of which about three-fourths is under farmer-managed tubewells and the rest is under agency management. Thus, the present groundwater development constitutes only a small fraction of the total potential.

About 70 percent of the total irrigation coverage in Nepal is under farmer-managed systems. Several government agencies have provided technical and financial inputs for irrigation

---

31 Social Scientist, International Irrigation Management Institute (IIMI) Nepal Field Operations.

32 Economist, Ministry of Agriculture, Nepal; and Research Specialist, Winrock, Nepal.

development. The approaches and procedures guiding their public interventions have varied. Agencies have been either amalgamated, separated, or fragmented within and between ministries. ADB/N involvement is in the farmer-managed category and that too through the provision of loans and subsidies. However, some grant assistance is provided for technical and managerial support. ADB/N is mainly involved in small surface irrigation, shallow tubewells and other types of technologies; while the other major irrigation institution, the Department of Irrigation (DOI), is involved in all types of surface irrigation and groundwater systems through grant assistance or through donor loans. While it would be useful to compare and contrast the impact of the grant and loan/subsidy systems on the irrigation performance and implementation process, the focus of this paper will be on the impact of loans/subsidies on the economic performance of some of the selected ADB/N STWs as studied by the International Irrigation Management Institute (IIMI).

IRRIGATION INSTITUTIONS AND POLICIES: IN THE CONTEXT OF NEPAL

Ever since the Third Five-Year Plan, the government has accorded high priority to irrigation development. However, it was only since the Sixth Plan that the government has emphasized equity and access to resources for the welfare of small and marginal farmers. New approaches and policies with the objective of improving irrigation planning and implementation were introduced in the Seventh Plan.

In 1988, the government formulated working policies on irrigation development for the fulfillment of basic needs (HMG/MOWR 1988). Salient features of these policies were as follows: (i) Farmer participation was made compulsory for all stages of the project cycle, while operation and maintenance, and capital costs were to be shared by the beneficiaries and the government; (ii) The National Irrigation Development Committee was formed to formulate working procedures, establish priorities, fix targets and coordinate all the agencies concerned with DOI and ADB/N as the main implementing agencies; (iii) ADB/N was allotted 227,000 ha (28 percent of total) to be further irrigated by the end of the century; (iv) Cost of construction was to be shared by the beneficiaries and certain subsidies were to be provided for groundwater systems; and (v) Operation and maintenance of small- and medium-scale surface systems, STW projects and deep tubewells were to be undertaken by the beneficiaries.

This new policy was to be implemented by means of two Action Plans. One for turning over some systems constructed and presently managed by DOI to farmers for operation, and the other to increase participation of farmers in the management of jointly managed systems.

The scenario regarding irrigation development by the government was that there were several agencies drawing from different sources of funding and a multiplicity of approaches regarding the implementation of projects. Project financing was in the form of outright grants, or partial loans with a substantial grant component, or a combination of grantees' contribution usually in the form of labor. Varying input levels, financial or otherwise, were required from the beneficiaries. The degree of beneficiary involvement during the projects differed from one agency to another and even from one project to another within the same agency. Different agencies approached the issue of operation and maintenance of the systems differently after completion. Some handed the systems over to the users, while others continued to control with minimal farmer input.

In view of such a fluctuating yet dynamic irrigation scenario and experience in Nepal, the various objectives and Action Plan documents are currently being consolidated into a new

irrigation policy document. The objectives of the proposed new irrigation policy (still in draft form) are as follows:[33]

i) To promote farmer organization participation in the irrigation sector through cost-effective, economical, and environmentally sustainable investment of irrigation development that contributes to a reliable increase in agricultural production and productivity.

ii) To integrate all support services crucial to irrigation expansion.

iii) To reorganize the management and technical units of DOI so as to support irrigation development objectives.

iv) To maximize the involvement and participation of beneficiaries so as to decrease government responsibilities in irrigation implementation and thereby promote local resource mobilization and self-reliance.

v) To support personal and community efforts in irrigation development.

vi) To support and strengthen the capacity of other nongovernment and government agencies in irrigation development.

vii) To support and enhance research capabilities of national institutions in irrigation technology and management.

It is with this evolving policy backdrop that we now turn to the analysis of ADB/N and the performance of the STWs that it has helped to install.

ADB/N'S IRRIGATION LENDING POLICIES

ADB/N reviews and appraises the borrower and the enterprise in accordance with policies and regulations approved by its Board of Directors. The salient features of the lending policy cover (i) eligibility, (ii) borrower participation and loan limit, (iii) security, (iv) interest rates, and (v) approval procedure.[34] ADB/N may finance 100 percent of project investment costs of irrigation when lending to small farmers.

Originally, the Bank tried to overcome capital constraints in the private sector for irrigation development through financing. It was realized that credit for irrigation development alone is not enough, and therefore, the Bank provided technical support for the irrigation sector both in the identification of suitable technologies and system development (IIMI 1991). Now, ADB/N is a major institution in irrigation development in Nepal. In search of newer and more appropriate technologies, ADB/N has propagated shallow tubewells, dugwells, rower pumps, and treadle pumps in the Tarai, in thousands of hectares utilizing groundwater potential.

---

33 As of 30 March 1992.

34 For details, see IIMI 1991.

ADB/N's STW Implementation Process[35]

By 1990, more than 20,000 STWs covering nearly 80,000 ha of irrigated area were financed by ADB/N. IIMI's report notes that in actual implementation, however, the availability of materials, the availability of drilling contractors, etc., have been determinant factors.[36] ADB/N provides both financial as well as technical assistance for installing STWs in the form of the appointment of driller technicians, supply of materials, and regular follow up and supervision of the performance of the units. In SFDP areas, the members are provided loans for STWs as community schemes. A pre-condition for a community scheme as laid down by ADB/N is that the members should have their lands contiguous to one another. Prior to approaching SFDP for loans, the interested members have to acquire a group recommendation for the loan through group decision. This decision is conveyed to the SFDP and since the loan is provided on the basis of group collateral the group itself should have credit-worthiness based on past performance. The whole group is at stake with the loan and the whole group is responsible for loan repayment. The group then decides on each member's repayment share.

In the non-SFDP, those who require loans have to first form a group. Yet, they are treated as individual borrowers who will have to provide with collateral also on an individual basis. The repayment is on the basis of the land in the command area of the scheme. Sometimes the loan is disbursed in the name of a single member of the group and the beneficiaries decide among themselves each individual's share. The Bank treats these as individual loans, thereby reducing transaction costs.

The Bank also provides 40 percent subsidy on the total cost and also on the pump sets. In community schemes, 75 percent subsidy is provided.

Economic Performance of ADB/N STWs

Six clusters of shallow tubewells (STWs) comprising 24 STW units were selected for the IIMI study, with two clusters each from the eastern, central and western Tarai. Each cluster included 2 to 5 units of STWs. The area irrigated by a unit of STW varied from 1.07 ha to 2.62 ha, with an average of 1.85 ha (see Table 7.1).

Average cropping intensity increased by 54 percentage points following STW development. This increase mainly came from the expansion of area under dry season crops like wheat. Another important consequence of STW development has been the substitution of rice-based cropping patterns for maize-based patterns in the eastern Tarai, and the substitution of high-value crops like vegetables for low-value crops in the central and western Tarai sites.

Significant yield gains in wheat (42%) and rice (41%) were achieved in STW sites after irrigation development. Yield gains were less dramatic for maize (21%). Among vegetable crops, potato showed the biggest potential for yield increase. The adoption of modern varieties of rice, maize and wheat and fertilizer application rates increased in most areas of the scheme.

---

35 For more details, see IIMI 1991.

36 For example, in 1989/1990, there was a drastic drop in STW installation due to the India/Nepal Trade Impasse and the general turmoil in the country.

Table 7.1. Summary of performance of STWs at selected locations.

Scheme	Region	Area irrigated (ha)	Hours of operation (Hrs/yr)	Cropping intensity		Yield (mt/ha)					
						Rice		Maize		Wheat	
				Before	After	Before	After	Before	After	Before	After
Belbari	Eastern	2.62	193	220	245	2.1	2.4	–	–	–	1.6
Baijnathpur	Eastern	2.30	271	197	257	1.5	2.2	1.0	1.8	–	1.6
Chandra-nighapur	Central	2.28	149	213	297	1.6	2.3	1.8	2	1	1.6
Gunjanagar	Central	1.71	128	216	222	1.5	2.6	1.9	1.8	1.3	1.4
Mahadevpuri	Western	1.07	120	149	240	1.4	2.5	1.4	1.9	1.4	2
Puraina	Western	1.33	138	180	238	1.8	2.4	0.7	1	1.1	1.9
Average		1.89	167	196	250	1.7	2.4	1.4	1.7	1.2	1.7

Table 7.2 summarizes economic and financial rates of return to STW irrigation in the sample sites. The internal rate of return (IRR) was higher than 25 percent in all six sites, indicating high benefits to society from investment in this technology. STWs are also financially attractive to farmers as shown by the average benefit-cost ratio (BCR) of 1.33. The estimated financial IRRs are high even though there seems to be considerable under-utilization of STWs. The average utilization of 167 hours per year is considerably lower than the recommended utilization of 800 hours per year. This indicates that there is a high potential for greater utilization of STWs, with corresponding increases in returns.

Table 7.2. Summary estimates of economic and financial returns to STW irrigation at selected locations.

Scheme	Economic returns		Financial returns			
			At full cost of investment		Excluding subsidy in investment	
	BCR	IRR (%)	BCR	IRR (%)	BCR	IRR (%)
Belbari	2.33	112.2	1.24	33.2	1.49	62.2
Baijnathpur	2.06	104.4	1.56	65.7	1.77	108.0
Chandra-nighapur	2.47	137.0	1.55	61.5	1.82	108.4
Gunjanagar	1.35	36.6	1.29	36.4	1.57	70.4
Mahadevpuri	1.54	47.8	1.23	31.4	1.48	57.4
Puraina	1.28	28.3	0.89	7.3	1.14	25.9
Simple Average	1.84	77.7	1.29	39.25	1.55	73.0

Notes: BCR = Benefit-cost ratio.
IRR = Internal rate of return.

Subsidies and their Impact on Groundwater Development

Subsidies are essential if private returns do not justify an investment which is otherwise socially beneficial. They may also be required to induce farmers to adopt a new technology. However, results of the financial analysis show that investment in STWs is financially attractive to farmers even without the 40 percent subsidy provided by the government. The average BCR of 1.33 and IRR of 41 percent are comfortably above the threshold of private incentive. In computing financial rates of return the opportunity cost of labor was assumed to be equivalent to the market wage rate. The BCR and IRR would be even higher than the computed values if a lower value for the opportunity cost were assumed. Thus, subsidies on STWs are not justified on efficiency grounds.

The proponents of irrigation subsidy argue that subsidies on groundwater development are essential to benefit small farmers. However, available data show that the groundwater program has so far benefitted mostly large farmers who need such subsidies least. For example, a 1986 survey of 248 STW owners distributed throughout the Tarai indicated an average landholding of 6.9 ha, and that pumpset owners fell within the top 10 percent of Tarai farmers by farm size (World Bank 1990). Thus, if the groundwater program is to meet the equity objective, careful targeting of subsidies will be crucial. This also calls for an active promotion of group ownership and use of STWs.

A more serious constraint to the continuation of subsidies on STWs is the limited availability of funds for groundwater development. Limited government funds for irrigation subsidies restrict the potential for groundwater development, as annual allocations of subsidy are exhausted within a few months. However, under this situation, a disproportionately larger section of the rich and the influential compete successfully for the subsidy.

The level of subsidies varies among different agencies involved in irrigation development. The groundwater systems developed by the Department of Irrigation require farmers to share only part of the operation and maintenance costs. In contrast, farmers who borrow from the Bank for groundwater schemes shoulder between 25 to 60 percent of the construction and maintenance costs as their responsibility. Thus, the implicit level of subsidy is much higher in DOI schemes than in the Bank-supported projects. In view of the economic analyses of the Bank-supported schemes, there is a need for critical review of government policies on subsidies for the irrigation sector.

A related subsidy issue is an assessment of the real rate of subsidy on STWs and the likely distortions on account of subsidy. Many respondents in the IIMI Survey expressed the opinion that subsidy should be measured relative to world prices and not to domestic prices, which are generally distorted. It was found that many domestically manufactured pumps and accessories were more expensive than similar products marketed in India and other countries and hence farmers were receiving a lower subsidy than they would have received under a free trade regime. Comparative data show that an STW installation (including pumpset) using Indian equipment costs Rupees (Rs) 6,361 less than what it costs using locally manufactured pumps and accessories. The Bank's requirement to finance only locally manufactured pumps and accessories implies that inefficient domestic industries are subsidized at the cost of farmers and the government. The price differential between imported and domestically manufactured pumps and accessories leads to a lower level of subsidy (23%) than the intended one (40%). The policy implication is that farmers should have a choice in the selection and purchase of equipment.

ASSESSMENT OF ADB/N SUPPORT TO STWs

Though ADB/N provides technical support for groundwater development, the IIMI research revealed that the number of technical staff is extremely inadequate to cover the large area under its program. The Bank also provides technical and financial support to the private sector by providing loans for establishing workshops, importing spare parts, purchasing boring equipment, leasing out pump sets to boring mechanics, and also providing training on STW installation to interested mechanics.

The STWs are owner operated and in the case of community schemes they are managed through mutually agreed arrangements. The beneficiaries are also responsible for repairs and maintenance. It was observed that where there was a lack of specialized mechanics many less skilled local mechanics did the repairs often aggravating the pump's condition rather than repairing it. There was better private sector support and easy access to this sector for repair and maintenance of STWs in areas near larger commercial towns.

Major Findings of ADB/N Pertaining to STWs

The economic analysis shows that there is greater payoff to society from investing in surface, shallow and sprinkler systems, i.e., most of the irrigation projects undertaken by the Bank.

A summary of the major findings specific to STWs as reported in the IIMI study are as follows:

i) Financial returns to STW schemes indicate that STWs are highly profitable to farmers.

ii) ADB/N's STW Program has benefitted small farmers also by providing STW units to groups of small and marginal farmers under community irrigation schemes.

iii) The utilization rate of STWs is low in terms of area irrigated, hours operated and range of crops irrigated.

iv) The absence of competition in the pump set market has effectively reduced the subsidy provided to the farmers by the government and has also led to poor after-sale services.

v) ADB/N's present level of technical manpower is inadequate to support its groundwater development program.

vi) The present level of training support to farmers on STW operation is generally inadequate.

PROPOSED STRUCTURAL CHANGES WITHIN ADB/N AND THE POSSIBLE AGENDA

In a recent MOU between ADB/N and ADB, Manila, for the proposed Sixth Agricultural Credit Project from the Manila Bank, the ADB/N is to undergo structural and functional change with a movement away from the prevailing technocratic institutional culture toward a "proper" banking culture focusing only on lending activities. As a condition for the loan as well as disbursement, ADB/N is to cut all nonbanking functions, including all technical advisory functions (other than those fully funded, including overhead costs, by other donor agencies) and farmer training from its purview, and will concentrate its efforts and funds only on its primary banking functions. These

nonbanking technical services divisions include the surface and groundwater irrigation sections. Technical staff, if retained by ADB/N are to be assigned as loan officers.

It would therefore be essential for ADB/N to reorient its programs and its method of project monitoring and evaluation. The technical expertise, previously in-house, will now be undertaken from outside (mainly from the private sector) since the Bank will henceforth concentrate only on lending activities. In the light of this new development, the capacity of ADB/N staff will have to be enhanced in its lending programs in irrigation development.

The following institutional development activities will be important:

i) Develop methodologies for appraising loan requests from farmers for specific irrigation sub-projects.

ii) Assess the capacity as well as draw up the necessary qualifications and competency of the private sector agencies which are potential project implementors.

iii) Develop an appropriate, participatory monitoring and evaluating system for the project, including indicators of project performance (which will be partly based on farmers' own performance criteria), reporting systems and formats, etc.

iv) Develop a procedure for monitoring the project and its implementor (i.e., NGO or private sector) in terms of project performance, and recommend timely corrective action on irrigation management and farmer participation.

Thus, to develop such in-house capacity the following would be important: (i) Inventorize and assess international and local NGOs and private firms that can provide services to ADB/N either in training for other agencies or as implementors themselves; (ii) Determine the necessary qualifications and training for such agencies of the private sector to fulfill objectives of irrigation development and draw up guidelines for selection of implementors for ADB/N; and (iii) Carry out the above mentioned activities in a couple of pilot areas (having different irrigation technologies and topographies) to field test the procedures developed.

Unless this type of in-house capacity to assess and monitor the private sector is built, a vacuum (that was previously filled by ADB/N) would be created. As was pointed out, if the ADB/N STWs had performed economically well, they could have still received more technical support from ADB/N. In fact, one of IIMI's recommendations was to enhance the technical support to be provided by ADB/N to STWs for sustainable development. Again, a donor has "forced" a structural and functional change on the borrowing institution but the fact remains that if technical assistance is to be relegated to the external, this must be managed and monitored by ADB/N. It should not be forgotten that the ADB/N did not commence its work only as a lending institution. It was realized from the very beginning that technical support was absolutely important if ADB/N's loans were to be effective. If the present ADB/N administration feels that it should only be a lending institution, then it must also consider the replacement of technical expertise somehow so that the loans can continue to be effective.

If the proposed or constricted role of ADB/N from a development bank to a commercial bank (to support privatization and the private sector) focussing on rural enterprises is to be adopted, at least at the initial stage, the market has to be managed, rather than expecting the market forces to fill in the gap.

Within the Bank itself there should be that in-house capacity to monitor and assess the private sector's technical expertise and also to facilitate enhancing the private sector in the technical roles previously accomplished by the Bank.

CONCLUDING REMARKS

This paper has examined ADB/N's support to STWs and the economic performance of those STWs in terms of sustainable support to STWs and the sustainability of STWs. It was found that the current level of subsidies needs to be reduced to distribute benefits to a larger section of the society and to target the marginal farmers as the real beneficiaries. Suggestions have been made for a new role for the Bank and its technical component will have to be phased out.

Bibliography

His Majesty's Government, Ministry of Water Resources (HMG/MOWR). 1988. Working policy on irrigation development for the fulfillment of basic needs. Kathmandu, Nepal: HMG/MOWR.

International Irrigation Management Institute (IIMI). 1991. Process and performance evaluation of ADB/N supported irrigation schemes. Kathmandu, Nepal: IIMI.

World Bank. 1990. Nepal Agriculture Sector Review. Washington, D.C.